

DTIC FILE COPY

(2)

DOT/FAA/DS-88/6

Advanced System
Design Service
Washington, D.C. 20591

AERONAUTICAL DECISION MAKING FOR AIR AMBULANCE HELICOPTER PILOTS: SITUATIONAL AWARENESS EXERCISES

AD-A200 274

R. J. Adams
J. L. Thompson

Systems Control Technology, Inc.
1611 North Kent Street, Suite 910
Arlington, Virginia 22209

July 1988

Final Report

This document is available to the public
through the National Technical Information
Service, Springfield, Virginia 22161.

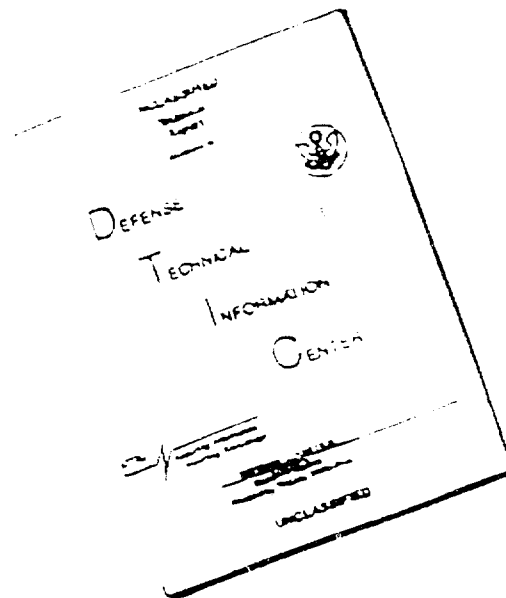


U.S. Department of Transportation
Federal Aviation Administration

DTIC
ELECTE
SEP 01 1988
S D E

88 8 31 09 9

DISCLAIMER NOTICE



THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

1. Report No. DOT/FAA/DS-88/6		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Aeronautical Decision Making for Air Ambulance Helicopter Pilots: Situational Awareness Exercises				5. Report Date July 1988	
				6. Performing Organization Code	
7. Author(s) R. J. Adams, J.L. Thompson				8. Performing Organization Report No.	
				10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address Systems Control Technology, Inc. 1611 North Kent Street, Suite 910 Arlington, Virginia 22209				11. Contract or Grant No. DTFA01-87-C-00014, W.O.5A	
				13. Type Report and Period Covered Final Report	
12. Sponsoring Agency Name and Address U.S. Department of Transportation Federal Aviation Administration 800 Independence Avenue, S.W. Washington, D.C. 20591				14. Sponsoring Agency Code ADS-220	
15. Supplementary Notes Advanced System Design Service System Technology Division Rotorcraft Technology Branch, ADS-220					
16. Abstract <p>➤ The following materials are based upon actual helicopter air ambulance accidents. They cover four broad accident types most recently associated with aeromedical accidents: night flying, weather, obstacle strikes, and mechanical failures. Three types of information are included for each accident type. These are: introductory/background material to provide you with the historical importance and frequency of each accident type; training knowledge that should be learned in order to avoid mistakes of the past; and decision making exercises.</p> <p>This is only one element of a multi-volume set of training materials designed to significantly reduce the helicopter air ambulance accident rate and keep it under control hereafter. The other volumes include:</p> <p>Aeronautical Decision Making for Helicopter Pilots Aeronautical Decision Making for Air Ambulance Helicopter Pilots: Learning From Past Mistakes Risk Management for Air Ambulance Helicopter Operators Aeronautical Decision Making for Air Ambulance Helicopter Program Administrators</p> <p>These decision making exercises are based on accident reports with persons and places de-identified. They are meant to enhance the basic manual: "Aeronautical Decision Making for Helicopter Pilots" by providing an insight to the types of decision errors which contributed to accidents in the past. The basic manual contains introductory and tutorial material necessary for improving basic decision making skills. Some material contained in that manual and not included in this one are: rotorcraft risk assessment; the self-awareness inventory; identifying and reducing stress; and headwork. Reading and understanding the concepts of decision making will improve the pilot's ability to analyze the scenarios contained herein.</p>					
17. Key Words Human Factors Human Performance Aviation Safety Aviation Training Pilot Error Judgement Decision Making Helicopter Pilot Helicopters Rotorcraft			18. Distribution Statement This document is available to the U.S. public through the National Technical Information Service, Springfield, Virginia 22161.		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 46	
				22. Price	

Acknowledgements

This Aeronautical Decision Making training manual for helicopter pilots involved in Emergency Medical Service (EMS) operations was prepared by Systems Control Technology, Inc. as a task in support of the Federal Aviation Administration's Helicopter Technical Support Contract (DTFA01-87-C-0014). It is based on material developed by SCT under a previous contract, combined with updated accident data analyses and a detailed review and evaluation by EMS pilots from the private and public service sectors. We would like to express our appreciation to the following agencies and organizations that helped us in the preparation of this material:

The National Transportation Safety Board (NTSB)
The Maryland State Police Aviation Division
MEDSTAR, Washington Hospital Center, Washington, D.C.
NIGHTINGALE, Alliance Health Services, Norfolk, Virginia

Their contributions helped make this manual possible.

Accession For	
NTIS GRA&I	<input checked="checked" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	



TABLE OF CONTENTS

	<u>Page</u>
1.0 Helicopter Air Ambulance Decision Making.....	1
1.1 Introduction.....	1
1.2 Hazards of Flying "In the Dark".....	1
1.3 Review of Aeronautical Decision Making Basics.....	4
2.0 Decision Making in Marginal Weather.....	8
2.1 Night -- En route -- Inadvertant IMC.....	8
2.2 Day -- En route -- Inadvertant IMC.....	10
2.3 Day -- En route -- Scud Running.....	12
2.4 Day -- En route -- VFR Not Recommended.....	14
2.5 Wire Strike -- Night -- En route -- Inadvertant IMC.....	16
2.6 Disorientation -- Night -- En route -- Partial Fog.....	20
2.7 Tree Strike -- En route -- Night -- Creeping IMC.....	22
2.8 Spatial Disorientation -- Approach -- Night -- Fog.....	24
3.0 Decision Making near Obstacles.....	26
3.1 Day -- Takeoff -- Collision with Obstacle.....	26
3.2 Day -- Takeoff -- Wire Strike.....	28
3.3 Night -- Takeoff -- Wire Strike.....	30
3.4 Day -- Takeoff -- Collision with Obstacle.....	32
4.0 Decision Making when Something Breaks.....	34
4.1 Failed Autorotation -- Night -- Approach -- VMC.....	34
4.2 Day -- En route -- Mechanical Failure.....	36
Appendix A Answer Key.....	A-1

1.1 INTRODUCTION

The following situational awareness exercises for air ambulance pilots are supplements to the basic manual on "Aeronautical Decision Making for Helicopter Pilots." The basic manual contains introductory and other material necessary for completion of the "judgment" course and should be read first. Material contained in that manual and not repeated here includes: Rotorcraft Risk Assessment; the Self-Assessment Inventory; Identifying and Reducing Stress; and, Headwork. Please read the basic manual and obtain a thorough understanding of all aspects of the decision making problem before attempting to complete these exercises.

Recent aeromedical helicopter accident statistics show that 67% of all fatal accidents are weather related. The vast majority (71%) of those occur during the hours of darkness, and during the en route segment of flights. Since about 40% of EMS operations are at night, this indicates a very serious problem. That is, pilots either are not being adequately trained, are forgetting their training or are not maintaining their proficiency in those special skills and knowledge demanded by flying in the dark.

Even on the clearest night with VFR conditions, a pilot can come close to IFR operations if there is no moon and/or no ground lights to establish a horizon reference. Or, on the other hand, a profusion of ground lights below and stars above can merge into a continuous sweep of pinpoints that deprive a pilot of any horizon reference. However, the real "killer" lurking in the night sky is the unseen cloud. Clouds disappear easily in the dark and you can fly into one without seeing it coming. Accordingly, the prudent aeromedical pilot must be proficient in keeping the helicopter upright by reference to instruments, even if he's not instrument rated.

1.2 Hazards of Flying "In the Dark"

Night helicopter flight presents many distinct hazards and piloting challenges not encountered during day VMC operations. First, the physiology of "Night Vision" greatly reduces the amount of visual information supplied to the brain. Second, some of the information that is supplied can be erroneous due to the effects of night visual illusions. Third, night helicopter operations require added dimensions of caution and respect to compensate for the eye's lack of daylight visual acuity. Finally, night flight requires diligent prior planning for both the operation and any possible emergencies.

Physiological Hazards

At night, your eyes use different receptors to process images in the subdued light. The impact of this process on flight operations is significant. First, your sharp daylight color vision is lost. You may see some colors, but only from brightly illuminated sources. Consequently, the major visual elements of depth, texture and size determination are lost during night flying. In addition, the ability to distinguish small or distant objects is greatly diminished. Furthermore, because the pupil dilates to gather as much light as possible, the depth of field is reduced.

These general night vision limitations are exacerbated by three other consequences of flying in reduced light. First, the transition from an area of bright light (ready rooms) to the dimly lit helicopter cockpit involves a period in which you will see even less than you do under normal night lighting. Your eyes may function below par for up to 30 minutes. For this reason, EMS operations are not conducive to obtaining night vision. Pilots must recognize this hazard and learn how to compensate.

Second, the eye has a central night vision blind spot that extends outward at a 5 to 10 degree arc. During night operations, it is important to scan more frequently and to avoid straight-ahead fixations. That blind spot is large enough to cover a medium size jet at 3000 feet. Finally, some researchers believe that about 75 percent of people with normal vision in daylight become nearsighted in dim light. Have your ophthalmologist or optometrist check your night distance vision if you suspect any problem.

Visual Illusion Hazards

We all learned about autokinesis and night myopia during our early flight instruction. When is the last time you thought about these potential hazards during an actual night operation? Autokinesis or "self movement caused by fixation" can be a threat when attempting to fix your location by reference to a single light source, particularly during takeoff and landing. Night myopia may be most pronounced in pilots wearing corrective lenses, but it can be avoided in all cases by concentrated scanning and by deliberate focusing on distant objects.

Distance determination can be particularly difficult in the dark. Distance perception is based largely on the relative light intensity and an assumption regarding the light source. Be aware of the fact that you are measuring light intensities at night and weigh those judgments against your familiarity with the sources available. Your distance judgment could be off significantly based upon unfamiliar light sources.

Finally, beware of "False Horizons". When there is little or no ambient light, and a steady, prominent light comes into view there can be an overwhelming sensation that the light source is above the horizon. The effect can be a climbing sensation and a strong impulse to pitch the nose down to compensate. When the light is fairly low and the sensation is strong, the impulse to pitch down can be dangerously strong and persistent.

The solution to all of these visual illusions and the inadequacy of night visual information is the same. Make use of every available source of information. For this reason, night flying is always, at least, partial instrument flying since the outside visual information that is available should be backed up with instrument readings.

Flight Operational Hazards

Night operations in a helicopter are only variations of those same maneuvers used in daylight. However, as illustrated by the accident statistics, there are compelling reasons to make a distinction.

- A. Hovering - Higher hovering altitudes should be used because of the difficulties in determining distances and relative motion during the hours of darkness. The higher altitudes help assure ground clearance and provide a better perspective to see additional light sources and improve motion senses.
 - B. Hover Taxi - There is a tendency to fly too close to the ground and at excessive speeds again due to the decreased sense of relative motion. Be extra vigilant regarding hover taxi speeds and the possibility of overshoots.
 - C. Takeoffs - Night takeoffs are best accomplished with additional reference to the altimeter and airspeed indicator in order to establish a safe departure vertical profile. Many of the visual images that are available in daylight will be missing at night so instrument scanning is important to establish a positive gradient and to stay out of the avoid areas of the height-velocity diagram.
 - D. En route - Night cruising flight should be at altitudes that are known to be well clear of all obstacles. Towers, wires and terrain features may not be visible within sufficient time to avoid a collision. Similarly, cruise flight at night makes difficult the visual acquisition of suitable landing sites for autorotation in the event of power or tail-rotor failure.
 - E. Landings - Night approaches are usually a little steeper and slower than daylight approaches. In the absence of electronic or visual glideslope information the pilot must rely more on airspeed and altimeter information in lieu of the usual visual cues available in daylight to assure a safe profile.
- Night approaches should terminate in a hover, with the landing lights on, to assure zero groundspeed before touchdown. Relative motion can be difficult to perceive in the absence of adequate light, and any drift at touchdown can be uncomfortable or even hazardous.
- F. Emergencies - The best preparation for night emergency landings is the realization that they are far more hazardous than daytime emergency landings, and to mentally rehearse the procedures before flight. As a minimum you should be sufficiently familiar with the cockpit to locate every essential control by feel.

It is sometimes virtually impossible to see specific terrain features in the dark, so preparation for emergency landings becomes much more critical. Special attention should be given to conservative fuel loads and to any maintenance discrepancies that might compromise the powertrain. Also, make sure that your seat belts are secure. When you are forced into an emergency landing at night use the landing lights and make the steepest possible approach if there is any chance of unknown obstacles.

Night Planning & Equipment

Every night flight should begin with a flight plan. That plan can be filed with the FAA if appropriate or it can be left with business

associates, even friends or family. Someone should know where you intend to fly and what schedule you intend to follow.

Charts for night flying should be carefully marked in colors visible under cockpit night lighting prior to the flight and folded for ready reference. Also, pertinent frequencies, altitudes, locations and other flight data should be carefully noted and readily available because it is far more difficult to manipulate pencils and paper in a darkened cockpit.

The FAA requires you to have a flashlight readily available on night flights, which can be extremely important in the event of electrical failure. In fact, because that flashlight is so important you should carry a spare. Personal experience will dictate any other important pieces of equipment that should be carried along, and they should be prepared and stowed in advance.

Night helicopter operations are not so much hazardous as they are unforgiving of human error. Fly with confidence based on knowledge, skill, experience and a healthy respect for the number and types of hazards and decisions you may encounter.

1.3 Review of Aeronautical Decision Making Basics

The term "pilot error" is often used to describe an accident cause and is generally an oversimplification, implying that the pilot intended to have an accident. Pilots always intend to fly safely, but they sometimes make decision errors. Their skill (or luck) is often sufficient to get them out of situations resulting from poor judgment. The objective of these exercises is to teach air ambulance helicopter pilots the techniques to avoid situations that require luck or skill greater than their capabilities. Good judgment means avoiding those situations that require superior skill to overcome.

The following material will not present any new information about flight, decision making, or stress. Rather, this material will reinforce your understanding and appreciation of the material you have studied in the basic Helicopter Pilots ADM text.

The following exercises require you to apply your newly acquired knowledge to aeromedical situations. The examples and scenarios used in these exercises are based on actual NTSB case files of pilots who made errors by failing to exercise good judgment.

In order to proceed with these exercises you must be thoroughly familiar with and clearly remember the following tenets of aeronautical decision making:

	ADM Manual Cross Reference
o Classic Piloting Psychological Pitfalls	p. 4-5
o Decision Making Concepts	p. 5-7
o Four Basic Risk Elements	p. 9-11
o Two Basic Risk Principles	p. 31
o Five Hazardous Attitudes	p. 45
o Antidotes for Hazardous Attitudes	p. 65
o Three Classes of Stressors In Flying	p. 86

If you do not clearly remember these basics, you should go back and review them before continuing. Before you begin the applications exercises, test your recall of the material by filling in the blank spaces with the correct information.

Match the classic piloting psychological pitfall on the left with the correct definition on the right by placing the proper letter in the blank space provided:

PITFALL	DEFINITION	ANSWER
1. Peer Pressure	a. Unjustified reliance on the aircraft's high performance capabilities.	_____
2. Mental Set	b. Inability to recognize deteriorating circumstances and/or misjudgment of the rate of deterioration.	_____
3. Get-There-Itis	c. The only alternative to flying into the ground.	_____
4. Duck-Under Syndrome	d. Unjustified reliance on the pilot's memory, flying skills, repetitive and familiar routes, etc.	_____
5. Scud Running	e. Poor decision making based upon an emotional response to others.	_____
6. Inadvertant IMC	f. Judgement impaired by a fixation on the original goal or destination.	_____
7. Neglect of Flight Planning, Preflight, Checklist	g. Allowing events or the situation to control your actions rather than the other way around.	_____
8. Flying Outside the Envelope	h. Inability to recognize and cope with changes in the situation different from those anticipated.	_____
9. Descent Below MEA	i. Ignoring minimum fuel resource requirements (either IFR or VFR).	_____
10. Operating Without Adequate Fuel Reserves	j. The tendency to "sneak a peek" by descending below minimums during an approach.	_____
11. Loss of Situational Awareness	k. The "duck under syndrome" during the en route portion of an IFR flight.	_____
12. Getting Behind the Aircraft	l. Pushing the capabilities of the pilot and aircraft by trying to maintain visual contact with terrain while trying to avoid physical contact with it.	_____

The six decision making concepts are:

To check your answers see Chapter 1.0, pages 5-7 in the manual.

The four basic risk elements are:

To check your answers, turn to Chapter 2.0, page 9 and read through the section again.

What two basic risk principles have been observed in decision making accidents?

1.

2.

Review Chapter 3.0 Section E (p. 31) on Balancing Risk While Flying to check you answers. Always be aware of the "Poor Judgment Chain".

The five hazardous thoughts are:

<hr/>	" <hr/> "
<hr/>	" <hr/> "
<hr/>	" <hr/> "
<hr/>	" <hr/> "
<hr/>	" <hr/> "

Check page 45 for the correct answers. Memorize the hazardous attitudes before proceeding.

The antidotes for hazardous attitudes are:

Hazardous Attitude

Antidote

<hr/>	" <hr/> "
<hr/>	" <hr/> "
<hr/>	" <hr/> "
<hr/>	" <hr/> "
<hr/>	" <hr/> "

Check page 65 for the correct answers.

The three classes of stressors in flying are:

Check page 86 for the correct answers.

2.1 Night -- En route -- Inadvertent IMC

The following true report is the story of a pilot who made a series of poor decisions which, in the end, were fatal. Read the story and then answer the questions which follow.

Accident Scenario:

(1) I had just successfully completed the transport of a heart patient. (2) Although the flight caused me to miss lunch, I decided to refuel and return to my base hospital as soon as possible, due to low (700') ceilings at my destination. (3) My single engine helicopter was not IFR certified. (4) I'd been flying this model for nearly 1500 hours and nothing's ever happened to me yet that required IFR capability. (5) As I approached the Control Zone of the local airport near my hospital helipad, I estimated the ceiling was about 400 to 500 feet and noticed there were some patches of clouds and fog below that. (6) I called Center and requested an SVFR clearance. (7) I knew I could make it to the helipad by following I-84 to the hospital. (8) I always make it back to my home base! (9) Center asked me to hold while they completed handling some IFR fixed wing approaches.

(10) As time dragged on, I had some difficulty staying clear of clouds and keeping I-84 in sight. (11) The next thing I knew a low fuel warning light came on. (12) I called Center to see what was holding up my clearance. (13) An eternity later, they called back and I was cleared SVFR to the helipad.

(14) Now what? - I've punched into a little bit of that low fog. (15) I'll just hold it level and fly through this baby like I would in my Cessna 182. (16) Who needs a helicopter instrument rating when you are already fixed wing rated? (17) Oh Sh...!!! its getting thicker and I've lost VFR. (18) Mayday!!! Mayday!!! "I'm inadvertent IFR and things look pretty bad."

Tower - "Roger sir are you capable of correction? Are you capable of and qualified for IFR flight?"

Pilot - Negative sir.

Tower - Could you give me your position and altitude.

Pilot - Im at, oh, two thousand two hundred and I'm five point one miles from....."

Questions:

1. The first principle of the decision making process states, "One poor judgment increases the probability that another poor judgment will follow." Which sentence best represents what this principle is about?
 - a. Number 1
 - b. Number 2
 - c. Number 3
 - d. Number 4

2. What hazardous attitude best describes the pilot's thinking in sentence 4?
 - a. Anti-Authority
 - b. Impulsivity
 - c. Invulnerability
 - d. Resignation
3. The risk element mentioned in sentence 5 is?
 - a. Pilot
 - b. Aircraft
 - c. Environment
 - d. Operation
4. What classic piloting psychological pitfall does the statement in sentence 8 represent?
 - a. Responding to Peer Pressure
 - b. Mental Set (or expectancy)
 - c. Scud Running
 - d. Get-There-Itis
5. What combination of risk elements does sentence 10 suggest?
 - a. Pilot/Aircraft
 - b. Aircraft/Environment
 - c. Environment/Operation
 - d. Pilot/Environment
6. What does sentence 15 suggest to you about the pilot?
 - a. He is not aware of the graveness of the situation
 - b. He is overconfident
 - c. He has overestimated his ability
 - d. All of the above.
7. Which antidote would you suggest for what the pilot is saying in sentence 16?
 - a. Follow the rules. They are usually right.
 - b. Not so fast. Think first.
 - c. I'm not helpless. I can make a difference.
 - d. It could happen to me.

2.2 Day -- En route -- Inadvertent IMC

The following exercise is based upon an NTSB case file of an accident which could happen to pilots of any experience level. An unexpected, lethal rolling fog bank surprised the pilot. He was unable to hold altitude and struck a mountain peak less than 60 seconds after entering IMC. Read the story and then answer the questions which follow.

Accident Scenario:

(1) I had just completed a well earned 3 day rest period at the beach cottage I share with 3 other pilots. (2) After a leisurely drive to the hospital I felt rested and ready for action as I arrived at 7:00 a.m. (3) Unfortunately, flight service quickly dampened my enthusiasm with a report of widespread IMC and "VFR not recommended" at 7:40 a.m. (4) By noon I was restless and anxious for something to happen -- anything. (5) I don't care if the weather is bad this morning, the 11:45 a.m. tower observation was 1500 scattered and 3 miles visibility. (6) Even if it goes SVFR, I can handle it.

(7) Finally, a nice easy 60 minute round trip to my favorite hospital. (8) I'd better get this thing cranked up and gone before somebody changes their mind.

(9) Tower, this is NT344 Papa how do you read?

(10) 44 Papa, I've been receiving you loud and clear, do you hear me now?

(11) Our radios have been messing up on us I'm reading you. We have departed to the Northwest - 44 Papa.

(12) What's that they're mumbling on the dispatch frequency - forty seven year old with intercranial bleeding? (13) My God, that must be painful. (14) I wonder what they have done for him? (15) I'd better pull out the stops on this one.

(16) Oh-oh it looks like the ceiling's dropping. (17) As long as I can see the ridge line I'll keep going. (18) I know there is a pass straight ahead. (19) I'll just put the autopilot on heading hold, I can make it. (20) I wonder how that poor patient is doing. (21) I hope we make it in time. (22) Those Feds and their stupid IFR requirements-this is a piece of.....

Questions:

1. Although rested and displaying professional attitude toward the weather and the aircraft, which hazardous attitude begins to surface in sentence 4?
 - a. Anti-Authority
 - b. Impulsivity
 - c. Invulnerability
 - d. Resignation

2. A second hazardous attitude is displayed in sentence 6. What is the antidote to this attitude?
 - a. I'm not helpless, I can make a difference.
 - b. Follow the rules they are usually right.
 - c. Taking chances is foolish.
 - d. Not so fast, think first.
3. What classic piloting psychological pitfall does the statement in sentence 8 represent?
 - a. Operating without adequate fuel reserves.
 - b. Inadvertant IMC.
 - c. Responding to peer pressure.
 - d. Neglect of flight planning, preflight inspection, check lists, etc.
4. Which of the basic decision making concepts is not adhered to in sentences 12-15?
 - a. Headwork
 - b. Cockpit resource management
 - c. Skills and procedures
 - d. Stress management
5. What piloting psychological pitfall does the statement in sentence 17 represent?
 - a. Scud running
 - b. Mental set (or expectancy)
 - c. Loss of positional/situational awareness
 - d. Getting behind the aircraft
6. What hazardous attitude is exhibited in sentence 19?
 - a. Resignation
 - b. Invulnerability
 - c. Macho
 - d. Impulsivity
7. The risk element acting on the pilot in sentence 20 is?
 - a. Pilot
 - b. Aircraft
 - c. Environment
 - d. Operation
8. What hazardous attitude best describes the pilot's final thought in sentence 22?
 - a. Macho
 - b. Anti-Authority
 - c. Invulnerability
 - d. Impulsivity

2.3 Day -- En route -- Scud Running

The following exercise is based upon an accident which occurred in a sparsely populated midwestern location. In the darkness of predawn, with low ceilings, in freezing rain and wet snow conditions, the flight was dispatched to position the helicopter for a patient transport. Read the story and then answer the questions which follow.

Accident Scenario:

(1) I was rudely awakened by a call from the dispatch at 4:30 a.m. (2) He called to remind me of a repositioning flight for a patient pick-up scheduled for 7:00 a.m. at Community Hospital in Pobanz. (3) As I began to wake up, I went over the 140 mile route in my mind. (4) I called flight service and already my day was starting to go bad and it was still dark outside. (5) They reported "ceilings 1500 feet to 2000 feet, sky broken to overcast, locally ceilings below 1000 feet, sky overcast, visibility below three miles with light snow and fog" with an outlook of "marginal VFR due to ceilings and a flight precaution for occasional to light rime icing." (6) I'd better get ready quickly, preflight and get airborne before this weather closes in. (7) No time to work out a flight plan, I'll just use local landmarks and keep my chart handy.

(8) Airborne, at last, it always feels good to get into an environment where I'm in control. (9) These ceilings don't look so bad. (10) Those Feds and their regulations can't keep a good pilot like me on the ground. (11) This flight should be a textbook ride, but I don't know why it had to be done before sunrise. (12) Oh well, if I didn't go, Ken, with his macho personality, probably would have volunteered. (13) Sure is dark out here in the middle of the prairie. What are those clouds doing at my altitude? (14) I better descend to try and maintain VFR. (15) Its pretty flat out here and I've never had a problem flying below 1000 feet before. (16) Now what? - is that rain or wet snow? (17) Why do I keep descending even though I've added more power? (18) Must be a fuel control problem. (19) I'd better slow down, this slushy rain makes ground contact flying mighty tough. (20) Maybe I'll go just a little low....

Questions:

1. What hazardous attitude best describes the pilot's thinking in sentence 6?
 - a. Impulsivity
 - b. Macho
 - c. Invulnerability
 - d. Resignation
2. What basic decision making concept is obviously lacking in sentence 7?
 - a. Cockpit resource management
 - b. Stress management
 - c. Headwork
 - d. Skills and procedures

3. The hazardous attitude illustrated by sentence 10 is?
 - a. Impulsivity
 - b. Macho
 - c. Invulnerability
 - d. Anti-Authority
4. What is the antidote to the hazardous attitude in sentence 10?
 - a. Not so fast. Think first.
 - b. Follow the rules. They are usually right.
 - c. Taking chances is foolish.
 - d. I'm not helpless. I can make a difference.
5. What piloting psychological pitfall does sentence 12 represent?
 - a. Get-there-itis
 - b. Mental set (or expectancy)
 - c. Scud running
 - d. Responding to peer pressure
6. What classic psychological pitfall does sentence 14 illustrate?
 - a. Get-there-itis
 - b. Mental set (or expectancy)
 - c. Scud running
 - d. Responding to peer pressure
7. What is the antidote to the hazardous attitude suggested in sentence 15?
 - a. It could happen to me.
 - b. Not so fast. Think first.
 - c. Follow the rules. They are usually right.
 - d. Taking chances is foolish.
8. What basic decision making concept is incorrectly applied in sentences 17 and 18.
 - a. Cockpit resource management
 - b. Risk assessment
 - c. Skills and procedures
 - d. Attitude

2.4 Day -- En route -- VFR Not Recommended

The following NTSB case file summary illustrates an extension of the cliché: "If it's too bad to go IFR, then go VFR." In this case, it was too foggy to use ground transportation so they dispatched a helicopter. Read the story, learn from it and then answer the questions which follow.

Accident Scenario:

(1) I heard the crew page at about 3:30 a.m. and headed toward the hospital helipad. (2) By the time I waited for the elevator and got to the pad the doctor, flight nurse and ground crew were already there. (3) Although I knew it would take more time, I decided not to depart without checking weather:

9344Z: Good morn-aft-morning this is Carebear.

FSS: Uh huh.

9344Z: We'd like to go from Big City to Sleazburg. What's the closest weather you've got.

FSS: Um huh. Ok. How soon you going?

9344Z: Now.

FSS: Ok, well, obviously VFR flight is not recommended. Sleazburg doesn't report overnight, but I'll get the best, ah, what I can for you on the weather. Big City had a special at 16 minutes past the hour: 800-scattered, one thousand feet four hundred scattered, measured ceilings 5000 overcast, visibility three miles with fog. The hourly temperature and dew point 34 and 32.

9344Z: Ok, that's the way its been most of the day.

FSS: North City's reporting 600' and 3 miles overcast with fog and south city 200' and 1 mile with temperature and dew point both at 32.

9344Z: I don't want to go punching into a storm that's coming but you know -

(4) Weather doesn't look so bad. (5) Besides I've flown in lower stuff than this for 15 years and nothing has ever happened to me. (6) Besides, company minimums have been practically jammed down our throats at 600'/2 miles. (7) I'd better not cancel or I'll get my *** chewed.

(8) This doesn't look so bad as long as I keep Big City's lights in my peripheral view. (9) I'll try 700' and see how things go. (10) Where did this fog come from? (11) That's ok - I can make it. (12) Maybe I'd better turn around and get back to visual contact. (13) Oh, what's the use - the fog's everywhere. (14) Now what was that heading to Sleazburg?

Questions:

1. What basic decision making concept is done incorrectly in sentence 4?
 - a. Headwork
 - b. Stress Management
 - c. Risk Assessment
 - d. Cockpit Resource Management
2. What is the antidote for the hazardous attitude represented by sentence 5?
 - a. Follow the rules. They are usually right.
 - b. Not so fast. Think first.
 - c. Taking chances is foolish.
 - d. It could happen to me.
3. What risk element is putting pressure on the pilot in sentence 7.
 - a. Pilot
 - b. Aircraft
 - c. Environment
 - d. Operation
4. The basic piloting psychological pitfall displayed in sentence 10 is?
 - a. Continued VFR into IMC
 - b. Mental set or expectancy
 - c. Scud Running
 - d. Get-There-Itis
5. What psychological pitfall is encountered in sentence 11?
 - a. Continued VFR into IMC
 - b. Mental set or expectancy
 - c. Scud Running
 - d. Get-There-Itis.
6. What hazardous attitude is displayed by sentence 11?
 - a. Resignation
 - b. Macho
 - c. Invulnerability
 - d. Impulsivity
7. What is the antidote for the hazardous attitude in sentence 13?
 - a. It could happen to me?
 - b. Taking chances is foolish?
 - c. I'm not helpless. I can make a difference.
 - d. Not so fast. Think first.

2.5 Wire Strike -- Night -- En route -- Inadvertant IMC

This accident scenario illustrates that even a cautious pilot who makes a conscientious effort to maintain situational awareness, assess risks and formulate decisions based on his knowledge and skills can miss important information. Concern for the patient, distractions of deteriorating weather and the workload involved with flying the aircraft can add up to an accident. It can happen to you!

Accident Scenario:

(1) The first flight of the day came at approximately 1630 local when we were requested to respond to a truck accident. (2) The mission was cancelled shortly after lift-off, however, as a ground ambulance had arrived at the scene and was loading the patient for transport to the hospital. (3) I circled the hospital area a couple of times to allow the battery to recharge and noted that the weather was probably 1500 ft. overcast with a few breaks, that there was some widely scattered wisps of clouds at about 1000 ft. and that visibility was at least 10 miles.

(4) When the ambulance arrived at approximately 1700 hours, the patient's head injuries suggested a high probability that he would need to be transported to one of the trauma centers in Springfield. (5) I called the Springfield FSS and requested the 1700 observation and forecast. (6) The weather reported was four hundred broken, seven hundred overcast, visibility one and one-half miles in light drizzle and fog and the temp/dew point was 47/46. (7) The forecast was possible improvement to 1000 ft., 4 to 5 miles. (8) I stated that with that temp/dew point spread I thought the weather was probably as good as it would get and in fact would probably get worse. (9) The briefer agreed. (10) The patient was finally stabilized and ready for transport at 1800 hrs. (11) I kept the patient waiting a few moments while I called the Elksburg FSS for the 1800 hr. observation. (12) Because of the temp/dew point, I really expected to learn that the weather had deteriorated, thus requiring the patient to be sent by ground ambulance. (13) When the briefer read the exact same weather observation that was given to me at 1700, I challenged it suggesting that I was being read the 1700 report instead of the 1800 report. (14) The briefer stated that this was indeed the 1800 observation and that the weather was exactly as it had been at 1700. (15) The briefer asked which hospital I was going to and when I replied St. Lucifer's, the briefer stated that conditions were better on the east side of town. (16) I replied, "Good, I'm on my way". (17) I departed at approximately 1810 hrs. in very light rain on a direct LORAN C course from Marlboro to St. Lucifer's Hospital. (18) I leveled off at 2200 ft. and noted how black the area straight ahead was with virtually no ground lights showing - it's a very sparsely populated area. (19) It seemed to be raining a little harder and I had to use a towel to help the defogger keep the windshield clear. (20) After only 4-5 minutes of flight I concluded there simply was not enough of a detectable horizon on this direct course to suit me. (21) I was very concerned about the temp/dew point spread and did not want to get caught with so little ground reference available and no hospital nearby to get the patient to. (22) I decided to turn north northwest to keep the lights of the homes and communities along the Highway 33/130 complex in

sight. (23) At that time, I was already thinking that the highest terrain and the most probable weather problem would be just west of the city of Dolesfield. (24) I concluded it was still a sound decision to orient on the lights along Highway 33, especially since it would allow me to land the patient at the Dolesfield Hospital if the weather did go sour. (25) As we approached Dolesfield, we were at 2000 ft. MSL but wisps of clouds were beginning to come by and it seemed the rain had increased.

Questions:

1. What does sentence 3 tell you about the pilot?
 - a. He is Macho.
 - b. He always takes time to observe the weather.
 - c. He has good situation monitoring and awareness skills.
 - d. He doesn't like to charge the battery.
2. What positive decision making concept is most strongly demonstrated by sentence 8?
 - a. Good Attitude
 - b. Good Headwork
 - c. Risk Management
 - d. Stress Management
3. What combination of risk elements is the pilot questioning in sentence 13?
 - a. Pilot/Aircraft
 - b. Pilot/Environment
 - c. Aircraft/Environment
 - d. Environment/Operation
4. What hazardous attitude begins to show in sentence 16?
 - a. Anti-Authority
 - b. Impulsivity
 - c. Invulnerability
 - d. Resignation
5. Sentence 20 & 21 are an excellent example of which decision making concept?
 - a. Headwork
 - b. Skills and Procedures
 - c. Stress Management
 - d. Risk Assessment
6. The first principle of "Pilot Error" states, "one poor decision increases the probability that another poor decision will follow." Which sentence best represents this principle?
 - a. 22
 - b. 23
 - c. 24
 - d. 25

(26) I told the paramedic that the weather was deteriorating and that it probably would be wise to land our patient there as I was beginning to doubt our ability to get on through to Elksburg. (27) I said I could not see any lights up on the plateau. (28) I asked the paramedic how long he thought it would take to get an ambulance to the Dolesfield hospital to pick up the patient. (29) He said he just didn't know. (30) I asked "at least 45 minutes or more?" and he said: "Yes at least that long or longer." (31) My reply was that we could still continue, but I suspected we would have to turn back. (32) Just after passing the hospital, it suddenly quit raining and the ceiling and visibility appeared to improve dramatically. (33) I commented to the paramedic that "it looks like I was wrong, the weather is improving." (34) There was at least 10 miles visibility to our left and right but I was still troubled about not being able to see lights or the tower in the vicinity of Shepherd on the plateau. (35) We traveled about 3-4 miles and suddenly encountered clouds and light rain. (36) The clouds sloped down and away so I reduced collective and started a gradual descent at 80 kts keeping below the clouds and keeping the ground lights and highway traffic in sight. (37) I could now see traffic coming and going on the plateau on top of the hill but noted the lights had a "halo" effect around them indicating developing ground fog. (38) I decided that with the temp/dew point as it was that it probably would just continue to get worse all the way to Elksburg so I elected to return to the Dolesfield hospital. (39) I reduced the collective and began a level flight deceleration, planning to initiate a turn at 60 kts so as to keep pretty much over the highway complex. (40) A couple of semi-trailer trucks were parked on the right shoulder (westbound) with their hazard lights blinking. (41) I had been watching them for at least a mile, initially thinking them to be the lights of emergency or patrol vehicles. (42) They were still to my front and I was using them as well as the on-coming traffic as a reference. (43) I believed us to be considerably higher above the ground than we obviously were as we struck a wire at that instant. (44) The aircraft pitched violently nose down and I remember thinking I didn't want to flex the rotor blade into the tailboom by coming back to hard on the cyclic. (45) I believe the wire must have broken about that time and although the aircraft returned to a somewhat level attitude, it was spinning wildly out of control. (46) I knew full well that we were crashing and simply tried to keep the aircraft upright. (47) After what seemed like three or four impacts, the aircraft came to rest on the highway center median with the engine still running and spewing a shower of sparks (similar to a large 4th of July fountain) onto the right side and to the right of the aircraft. (48) I tried to roll the throttle off but was unsuccessful, so I moved the fuel valve to the off position, turned off the battery switch (had a little trouble locating it), exited the aircraft through the open left side and disconnected the battery. (49) I then checked the condition of the patient who was lying along the left side of the aircraft and detected no signs of life. (50) I then checked the paramedic, who was lying about eight feet beyond the patient. (51) He was lying on his right side and appeared in reasonably good shape, responding calmly to all my questions. (52) I then remembered the oxygen bottles and found them in the wreckage spewing forth their contents and shut them off. (53) By this time, numerous people were arriving on the scene including a nurse who took over the task of looking after the paramedic until an ambulance arrived.

7. Which decision making concept is the pilot wrestling with in sentences 27, 28, and 29?
- a. Attitudes
 - b. Risk Management
 - c. Skills and Procedures
 - d. Headwork
8. What piloting psychological pitfall traps the pilot in sentence 31?
- a. Get-There-Itis
 - b. Get Behind the Aircraft
 - c. Responding to Peer Pressure
 - d. Loss of Situational Awareness
9. What does the pilot action in sentence 36 suggest?
- a. Get-There-Itis
 - b. Responding to Peer Pressure
 - c. Getting behind the Aircraft
 - d. Continuing VFR into IMC
10. What risk element is the pilot confronting in sentence 48?
- a. Pilot
 - b. Aircraft
 - c. Environment
 - d. Operation
11. What risk element is the pilot confronting in sentence 52?
- a. Pilot
 - b. Aircraft
 - c. Environment
 - d. Operation

2.6 Disorientation -- Night -- En route -- Partial Fog

This accident case file was selected to demonstrate that spatial disorientation can cause even the most experienced pilots to have a fatal accident. It is a fast and fatal physiological phenomenon that occurs subtly and without warning. Read the following paragraphs and then answer the questions which follow.

Accident Scenario:

(1) The dispatch call for a routine inter-hospital transfer came at 10:30 p.m. about halfway through my 12 hour shift. (2) I was supposed to fly from Dipstick Hospital Center to University Hospital, pickup the patient and return. (3) The night was clear with about 50 miles visibility under the full moon so I decided to make an inflight check of weather to save time. (4) Flight Service did not have a weather report for Dipstick, but the last hourly report from Fastrock, 60 miles away was "clear with unlimited visibility, temperature 15 degrees, dewpoint 8 degrees, winds 140 degrees at seven." (5) Looks like an easy hop, so I'll just stay low and enjoy the mountain scenery. (6) Some people wouldn't like flying 800 feet at night, but I can do it as easy as driving down the turnpike.

(7) I better report my ETA to control. (8) Those landlubbers get worried real easy lately. (9) I don't know why they can't just let me do my job. (10) Who makes up these stupid rules anyway?

(11) I wonder why I can't see Big Rock pass, I know it's dead ahead? (12) Where did these little clouds come from? - that's the third one in the last five minutes. (13) I better descend a little to stay in the clear. (14) It sure got dark when the moon was obscured by that ridge. (15) I'll just turn on my nightvision and use it to navigate until I get the moonlight back. (16) I've done that the last three night transports. (17) There just aren't any flight situations I haven't seen and handled safely. (18) Nothing can happen to me.

(19) Wow! those trees on the left are pretty close. (20) I'd better start a shallow right turn. (21) What's that? - another cloud, boy they sure are.....

Questions:

1. Which hazardous attitude does the pilot exhibit in sentence 6?

- a. Anti-Authority
- b. Impulsivity
- c. Invulnerability
- d. Macho

2. Which hazardous attitude is illustrated in sentence 10?

- a. Anti-Authority
- b. Impulsivity
- c. Invulnerability
- d. Macho

3. What risk element should the pilot have been alerted to in sentence 11?
 - a. Aircraft
 - b. Environment
 - c. Operation
 - d. Pilot
4. What basic psychological piloting pitfall traps the pilot in sentence 13?
 - a. Get-There-Itis
 - b. Duck Under
 - c. Mental Set (or expectancy)
 - d. Scud Running
5. What decision making skill is not properly applied in sentence 15?
 - a. Risk Assessment
 - b. Stress Management
 - c. Skills and Procedures
 - d. Headwork
6. What decision making skill is not properly applied in sentence 16?
 - a. Risk Assessment
 - b. Stress Management
 - c. Skills and Procedures
 - d. Headwork
7. What hazardous attitude does the pilot vividly display in sentence 18?
 - a. Anti-Authority
 - b. Impulsivity
 - c. Invulnerability
 - d. Macho
8. What basic risk principle is illustrated in sentence 20?
 - a. A safe flight is one that ends with pilot, passengers and aircraft intact.
 - b. One bad decision generally leads to another.
 - c. Stress Management.
 - d. Risk Management.

2.7 Tree Strike -- En route -- Night -- Creeping IMC

This accident illustrates, via the report of a surviving pilot, how two important decision making principles can provide an early warning to pilots that the risk of an accident is increasing. First, accidents are the result of a chain of events occurring as a series of errors in decision making. Second, as the poor judgment chain grows, the alternatives for safe flight decrease.

Accident Scenario:

(1) At 2220 on 12 June the dispatcher contacted me in reference to an impending flight. (2) I advised her I would check the weather; FSS advised that the forecast, I believe until noon the next day, was for 2,000 broken with 4 miles rain and fog, with a chance of 500 feet and 1/2 mile with heavy rain showers. (3) They also advised there was some activity in the Gulf. I asked direction and speed; and was told NE at 18 knots. (4) I recontacted dispatch and told them that the weather should be acceptable. (5) The crew was dispatched at 2227. (6) I proceeded to the aircraft and took off at 2233. (7) En route the ceiling was as reported and flight visibility was 10 -15 miles. (8) As we passed abeam Sargasso Springs area I noticed a dark area over the Gulf. (9) It appeared to be heavy rain showers with no lighting and approximately 5 miles in diameter.) (10) I advised the crew to keep our ground time as short as possible. (11) We landed at 2321 and departed at 2355. (12) I climbed to 1500 ft. MSL. (13) At 0003 I turned east to avoid a heavy rain shower ahead of us and notified our dispatcher. (14) Just west of Rolling River the rain had lightened up substantially, so I resumed course at 0009. (15) I encountered another heavy rain shower and again turned east and descended to 1000 - 1200 ft. MSL. (16) At 0015 I cleared the weather and turned towards Balesville again. (17) I started to fly north along I-25 and noticed another area of heavy rain showers just NE of us. (18) Also an area of fog had formed behind the path of the rain showers. (19) I could see approximately 1/2 mile through it. (20) I saw a rest area below us and noted to myself I could land there if I needed to. (21) At 0020 I diverted east again. (22) At about 0022 I called Balesville FSS for a weather update. (23) They advised they had an area southeast of Beaver City. (24) I asked if they could advise the size and I believed their response was, "It appears to be 5 to 7 miles in diameter. (25) I elected to continue around the rain. (26) Altitude was still 1000 - 1200 ft. (27) At about 0024 the paramedic observed that the weather was clear towards Balesville. (28) I looked that direction and the rain intensity appeared greatly diminished, with adequate ground references. (29) I started a left turn from 060 degrees toward 330 degrees. (30) At 0026 the paramedic asked, "Was that a tree?" (31) As I glanced toward his side I saw something pass by the position light. (32) Then in my peripheral vision noticed a thin tree top on my side. (33) I started a left climbing turn and added power just as I struck the tree. (34) The chin bubble broke and the pilot door was ripped off by the tree. (35) I think I heard the paramedic say, "Get it up, get it up!" and I replied, "I am!" (36) I climbed to about 700 ft. MSL and was indicating about 70 KTS. (37) I notified dispatch that we had struck a tree and that the crew and aircraft were alright. (38) I think I told dispatch I would land in a minute or two and call them with the location. (39) There was a development NE at about 2 miles. (40) The aircraft was handling well so I continued to that area for better lighting and a probable telephone. (41) I landed at about 0027.

Questions:

1. What risk element is the pilot aware of in sentence 8?
 - a. Pilot
 - b. Aircraft
 - c. Environment
 - d. Operation
2. What decision making concept is the pilot applying in sentence 10?
 - a. Risk Management
 - b. Attitude
 - c. Headwork
 - d. Skills and Procedures
3. What psychological piloting pitfall occurs in sentence 15?
 - a. Responding to Peer Pressure.
 - b. Loss of Positional/Situational Awareness.
 - c. Get-There-Itis
 - d. Continuing VFR into Instrument Conditions
4. What basic decision making trait is evidenced in sentence 21?
 - a. Skills and Procedures
 - b. Risk Management
 - c. Attitudes
 - d. Stress Management
5. What decision making principle is exhibited in sentence 26?
 - a. Situational Awareness
 - b. Headwork
 - c. Attitude Management
 - d. Poor Judgment Chain
6. What Psychological pitfall has the pilot made in sentence 31?
 - a. Flying outside the envelope
 - b. Getting behind the aircraft
 - c. Loss of positional/situation awareness
 - d. Mental set (or expectancy)
7. What decision making concept saves the pilots life in sentence 37?
 - a. Headwork
 - b. Skills and Procedures
 - c. Risk Management
 - d. Attitudes

2.8 Spatial Disorientation -- Approach -- Night -- Fog

The following helicopter accident was not fatal, however, it very well could have been. This accident scenario illustrates the poor judgment chain, lack of situational awareness, improper cockpit resource management, responding to pressure and poor flying procedures. Read the accident account and reflect upon how you may have reacted differently. Then answer the questions which follow.

Accident Scenario:

(1) Boy, I hate these milk run flights. (2) I'll sure be glad to get home and sleep in my own bed tonight. (3) Do you think we should have checked weather with Flight Service? (4) Why? You know the boss expects us to get this machine back home no matter what. (5) Besides, Jack's on dispatch tonight. (6) He'll take good care of us. (7) Nothing ever happens this time of night anyway.

(8) I just got a call from Jack. (9) He says the weather is OK now, but wants us to hurry. (10) Fog is coming in and it may be pretty bad in another half hour. (11) Should we request an instrument flight plan? (12) Naw, that would take too long and might extend our approach leg even further. (13) We don't need IFR to make it home. (14) This ground fog rolls in every night this time of year, but it doesn't get too bad for another couple of hours.

(15) There goes another puffer cloud. (16) That makes three in the last minute or so. (17) We'd better descend to maintain VFR. (18) It looks OK here at 400 feet. (19) DME says we're 10 miles out so let's start looking for the airport. (20) It's pretty black out there and we're in the clouds again. (21) I'm going down to 200-300 feet. (22) You keep looking around for the airport, I'll stay on the gauges.

(23) I can't see anything out there. (24) Want me to tune in the ILS to one-eight. (25) Naw, let me look, you watch the instruments. (26) We must be almost on top of the airport by now. (27) Is that it at one o'clock? (28) No that's I-75, I think. (29) No, I mean just beyond the highway. (30) Got it in sight yet? (31) No still loo....

Questions:

1. What piloting psychological pitfall is evident in sentence 2?
 - a. Responding to peer pressure.
 - b. Scud Running
 - c. Mental Set (Expectancy)
 - d. Get-there-itis
2. What risk element pressures the pilot to make the statement in sentence 4?
 - a. Pilot
 - b. Aircraft
 - c. Environment
 - d. Operation

3. What is the antidote to the hazardous attitude in sentence 7?
 - a. It could happen to me.
 - b. Not so fast. Think first.
 - c. Follow the rules. They are usually right.
 - d. Taking chances is foolish.
4. What basic decision making concept is incorrectly used in sentence 13?
 - a. Attitude
 - b. Cockpit resource management
 - c. Risk assessment
 - d. Skills and procedures
5. What basic decision making concept is incorrectly used in sentence 14?
 - a. Attitude
 - b. Cockpit resource management
 - c. Risk assessment
 - d. Skills and procedures
6. What basic decision making principle is illustrated by sentences 4, 12 and 17?
 - a. Headwork
 - b. Risk management
 - c. A safe flight is one that ends with pilot, passengers and aircraft intact.
 - d. One bad decision generally leads to another.
7. What psychological pitfall is illustrated in sentence 21?
 - a. Scud Running
 - b. Responding to peer pressure
 - c. Mental set (or expectancy)
 - d. Get-there-itis
8. What decision making concept is not used in sentences 24 and 25?
 - a. Attitude
 - b. Cockpit resource management
 - c. Headwork
 - d. Skills and procedures

3.1 Day -- Takeoff -- Collision with Obstacle

The following is based on an actual accident. The routine takeoff, performed by the pilot countless times before, turned out to be anything but routine. Read the story and then answer the questions which follow.

Accident Scenario:

(1) We were two minutes away from an on-scene pick-up when we received a call from dispatch to divert to a nearby hospital. (2) I figured it had to be something pretty serious to call us away from a mission like that. (3) I broke off the approach, hightailed it over to the hospital and circled the improvised heliport in the parking lot. (4) Some cops had used their cruisers to block off an area for us to land - with all those light poles around, it sure looked small. (5) But this wouldn't be the first time I've landed in such a confined area, I can do it. (6) Nevertheless, on short final the old adrenalin was pumping and I was tense - I told Barney and Anne, the paramedics, to watch carefully, saying it was "kinda tight". (7) I knew they needed us, however, so I stayed with it and we landed safely.

(8) We had really busted our buns to get there as quick as we could because every minute counts in this business. (9) Over an hour later we were still sitting in that cockamamie parking lot waiting for a receiving hospital to be lined up! (10) It was past dinner time when we were finally given our destination, a trauma center half way across the state, and I had only twenty-six gallons in the tank. (11) After checking the patient, on his litter, secure in the aircraft, I told Barney we were going to stop at Midville Airport to refuel and he gave me a surprised look in response. (12) I guess he knows I don't like to refuel with passengers onboard - but we were in a bind, it couldn't be helped.

(13) I buckled up and made sure Barney and Anne were too (Damn! When we get back, I'm going to insist they install shoulder harnesses in this thing). (14) I got a "thumbs-up" from the cops, who had been standing by, and started the engine. (15) As it spooled up I looked at the light pole right in front of me and remembered one of the Chief Pilot's war stories about a tight LZ in "The Nam". (16) He had said: "...if you can get it in, you can always get it out.", and I guessed I'd show him, and these cops, too, that I had what it took. (17) I also looked at the fuel gauge and, recalling Barney's surprised expression, I was frowning myself as I pulled pitch.

POLICE REPORT: (18) The helicopter lifted-off in a quick but smooth motion. (19) Just as the helicopter neared the light pole, there were two quick, loud bangs. (20) The helicopter fell to the ground upside down. (21) From my position, I could see that the pilot was already a probable fatality.

Questions:

1. What is the risk element mentioned in sentence 4?
 - a. Pilot
 - b. Aircraft
 - c. Environment
 - d. Operation
2. The pilot's thinking in sentence 5 is characteristic of what hazardous attitude?
 - a. Anti-Authority
 - b. Macho
 - c. Invulnerability
 - d. Resignation
3. What combination of risk elements does sentence 6 suggest?
 - a. Pilot/Aircraft
 - b. Aircraft/Environment
 - c. Environment/Operation
 - d. Pilot/Environment
4. What classic piloting psychological pitfall does the statement in sentence 7 represent?
 - a. Responding to Peer Pressure.
 - b. Mental Set (or expectancy).
 - c. Loss of Situational Awareness.
 - d. Get-There-Itis.
5. What stressors are evident in the pilot's statements in sentences 8, 9 and 10?
 - a. Fatigue and Boredom
 - b. Frustration and Impatience
 - c. Worry and Hunger
 - d. All of the Above
6. The concept of Risk Management, and its probable influence on flying safely, is best illustrated in which sentence.
 - a. Sentence 11
 - b. Sentence 12
 - c. Sentence 13
 - d. Sentence 14
7. What antidote would be best applied to what the pilot is saying in sentence 16?
 - a. Taking changes is foolish.
 - b. Not so fast. Think first.
 - c. Follow the rules. They are usually right.
 - d. It could happen to you.

3.2 Day -- Takeoff -- Wire Strike

The following scenario is based on an actual accident. Confined area operations at unprepared landing zones always have the potential for unseen danger. This one proved to be no exception. Read the story and then answer the questions that follow.

Accident Scenario:

(1) There it is - wow! - She musta been doing ninety around that curve. (2) We'll just circle around here and take a look at the LZ. (3) I see the initial response paramedic unit that called us. (4) Good, they've got the traffic stopped so we can land in the road -- that's quite a backup already. (5) Looks like the wind is calm, I'll just land to the west so the patient loading door is on the side of the accident. (6) I'm sure the flight nurses will appreciate that.

(7) Okay, we're on the ground, I guess I'll keep the engine running because it looks like they've got the patient about ready to go. (8) Boy, those flight nurses sure are dedicated, they didn't waste any time getting over to that victim. (9) She looks like she's hurt pretty bad. (10) If I friction down the controls, maybe I can help by getting out and opening the door for them. (11) There, while I'm out here I'll just have a quick look around to see what's the best way outta here. (12) Hmm, telephone poles on both sides of the road. (13) Looks like the only way out is down the road between them, over those cars. (14) I don't see anything from here.

(15) "Okay, all set?" (16) "Let's go! - Get your seat belts fastened." (17) "We're on the roll...hey I said buckle up!" (18) "What?, I know she's in a bad way, but you've got to..." (19) Oh, to hell with it, they've got a job to do. I can't make them strap in. (20) We'll get her to the hospital, like always. (21) What was that? (22) Holy Cow, a wire, where'd that come from? (23) I've lost cyclic and collective control! (24) Still got rudder though, I can keep it straight. (25) We're going in - hope we hit something soft! (26) Look out - a car! (27) Ohhhh sh__!

(27) I don't believe it. We crashed! (29) How could this happen? (30) Hey, is that a fire - got to get the fuel valve off -- there. (31) They're coming to get us out...God, it hurts!

Questions:

1. What risk element is referred to in sentence 4?

- a. Pilot
- b. Aircraft
- c. Environment
- d. Operation

2. What combination of risk elements make up the situation as considered in sentence 5?
 - a. Environment/Aircraft/Operations
 - b. Environment/Pilot/Aircraft
 - c. Environment/Operation/Pilot
 - d. Aircraft/Operation/Pilot
3. That the pilot is responding to peer pressure (a classic piloting psychological pitfall) and tempted to do something against his better judgement is evident in his thinking in which sentence?
 - a. Sentence 7
 - b. Sentence 8
 - c. Sentence 9
 - d. Sentence 10
4. A WSPS (Wire Strike Protection System) probably would have prevented this accident. If one had been installed, which aspect of the ADM process would this illustrate?
 - a. Attitude Management
 - b. Stress Management
 - c. Risk Management
 - d. Crew Management
5. That a series of bad decisions reduces the alternatives for continued safe flight is best illustrated in which sentence?
 - a. Sentence 10
 - b. Sentence 11
 - c. Sentence 12
 - d. Sentence 13
6. Which antidote would best help the pilots attitude in sentence 19?
 - a. "Taking Chances is Foolish."
 - b. "I can make a difference."
 - c. "Follow the Rules."
 - d. "Not so Fast."
7. The pilots thinking in sentence 20 is characteristic of which hazardous attitude?
 - a. Macho
 - b. Invulnerability
 - c. Resignation
 - d. Anti-Authority
8. What kind of response to the change in situation is the pilot using in sentence 24.
 - a. Skills and Procedures
 - b. Headwork
 - c. Both of the Above
 - d. None of the Above

3.3 Night -- Takeoff -- Wire Strike

This accident actually happened. Only the names have been changed...etc. It goes to show that, even when you do everything right, things can still go wrong. Read the story and then answer the questions which follow.

Accident Scenario:

(1) The call came in at "zero-dark-thirty"; two critically injured accident victims on the freeway. (2) While Dan, my paramedic, talked via landline with the fire engine crew at the scene, I worked up a quick but thorough VFR flight plan, as per company policy, and filed it with ops at home base (a big trauma center). (3) The weather was CAVU but, being the middle of winter, it would be dark for most of the first half of the mission. (4) After launching at around 0500, we were able to contact the on-scene first responders via the fire net. (5) They advised planning an approach and departure to the south. (6) We had worked with these guys before and I knew that they knew their business, so I concurred. (7) They had the LZ all set up when we got there.

(8) After landing, Dan and I made sure the two patients and their attending flight nurses were strapped in and secure before doing the same ourselves. (9) With all the flashing lights, flares and other ambient light at the scene, I couldn't see very far to the south - our intended takeoff direction. (10) No matter, I planned a vertical, max performance takeoff to at least 75 feet before transitioning to forward flight. (11) Even if you can't see what's in front of you, you can be pretty sure of what's directly above you. (12) That's the way I planned to go out. (13) I knew from my preflight that the cool night air and my two good engines would give me all the power and lift I would need, with some left over.

(14) Just to be double sure, I got a hover check and then slowly pulled collective. (15) After passing 75 feet AGL, I pushed the nose over and gradually accelerated. (16) All of a sudden, two wires appeared in my landing light beam! (17) Back on cyclic, up on collective - we cleared them! (18) Oh no, another one! (19) That one we hit below the nose - then it got tangled up in my "tail feathers". (20) It actually had us tethered momentarily before it broke, taking my tail rotor with it. (21) I immediately lowered the collective and got the engines back to the flight idle stops. (22) We made a hard vertical landing that spread the skids and broke off what was left of the tail boom. (23) Everyone, including the patients, were more-or-less okay, though. (24) I found that I couldn't shut down number two, so I climbed out, opened the access door in the cowl, and manually turned the fuel shut-off valve. (25) I then went back into the cockpit, applied the rotor brake and switched off the battery.

Questions:

1. What classic piloting psychological pitfall is the pilot avoiding in sentence 2?
 - a. Get-There-Itis
 - b. Mental Set (or expectancy)
 - c. Unjustified Reliance on Memory
 - d. Responding to Peer Pressure
2. What risk element is the pilot thinking about in sentence 3?
 - a. Pilot
 - b. Aircraft
 - c. Environment
 - d. Operation (mission)
3. In sentence 6, the pilot is applying an antidote to which hazardous attitude?
 - a. Anti-Authority
 - b. Macho
 - c. Resignation
 - d. Invulnerability
4. What combination of risk elements does sentence 9 suggest?
 - a. Aircraft/Environment
 - b. Pilot/Operation
 - c. Environment/Operation
 - d. Pilot/Environment
5. In sentence 10, the pilot is applying another antidote to a hazardous attitude. Which one?
 - a. "Follow the rules."
 - b. "It could happen to me."
 - c. "Chances are foolish."
 - d. "I'm not helpless."
6. In response to a perceived change in the situation, the pilot is using good skills and procedures in which sentence?
 - a. Sentence 16
 - b. Sentence 17
 - c. Sentence 18
 - d. Sentence 19
7. The ADM concept of Risk Management, as applied to this situation, would be well illustrated if which of the following had been done?
 - a. Install orange marker balls on wires near or over freeways.
 - b. Equip and train the pilot with night vision goggles (NVG).
 - c. Install wire strike protection system (WSPPS) on the aircraft.
 - d. All of the above.

3.4 Day -- Takeoff -- Collision with Obstacle

This is an accident that shouldn't have happened, but it did. The pilot found out the hard way that sometimes a combination of relatively harmless conditions can add up to a very dangerous situation. Read the story and then answer the questions which follow.

ACCIDENT:

(1) We were all snug and warm in the "ready room", when we were called out just after lunch to go pick up an employee of a nearby hospital that had suffered a stroke. (2) We all knew and liked her so we didn't waste any time getting on our way. (3) The weather was cold and clear with a light wind blowing from the west - no need for a flight plan. (4) The helicopter was parked, as usual, on the narrow ramp off the helipad. (5) I had complained about this practice that left me less than a foot on either side between the skids and the curb. (6) But the hospital administrator had said that we needed to keep the main pad open for other helicopters and we can't park on the River Pad a half mile away because of the ground transport delay, so that was that. (7) As a matter of fact, on my way to the helicopter, as I stepped over the curb I tripped on one of the upright bolts that had anchored the fence that used to be there. (8) I thought to myself one of these days I'm at least going to get those removed, if I have to take a hacksaw to 'em myself.

(9) As Amy and Joyce, the two flight nurses, and I buckled up, I made some quick mental calculations. (10) With the crew, a full load of gas, and all the medical equipment on board, the addition of a patient would put us pretty near to max gross. (11) A glance at the windsock told me the wind was blowing left to right at about five knots. (12) Everything was normal for takeoff.

(13) But, as soon as I lifted into a hover, things started to go to hell in a handbasket! (14) We couldn't have been a foot off the deck when we started to roll to the right. (15) As I added power, something gave way with a loud snap and we lurched even faster to the right. (16) With my heart in my throat, I caught a glimpse of the main hospital building out of my right eye - we were going to hit it!

(17) I wasn't about to let that happen. (18) As I tried to recover, I must have yanked back too hard on the cyclic because I felt the tail rotor strike the deck behind us. (19) This was followed by an uncontrollable spin to the right. (20) I realized I'd lost my tail rotor, but there wasn't much I could do about it at the moment - I had my hands full keeping away from the building. (21) After two or three revolutions, we were back over the helipad, so I cut the throttle, stopped the spin and set her down hard. (22) The helicopter was a mess but, thank God, we were all okay.

QUESTIONS:

1. The possibility that the pilot may have experienced some physical stress during the episode is suggested by which sentence?
 - a. Sentence 1
 - b. Sentence 2
 - c. Sentence 3
 - d. Sentence 4
2. That there may have been some psychological stress involved is suggested in which sentence?
 - a. Sentence 1
 - b. Sentence 2
 - c. Sentence 3
 - d. Sentence 4
3. Which combination of risk elements is considered in sentences 10 and 11?
 - a. Environment/Aircraft
 - b. Environment/Pilot
 - c. Operation/Environment
 - d. Operation/Pilot
4. What hazardous attitude is suggested by the pilots statement in sentence 6?
 - a. Anti-Authority
 - b. Macho
 - c. Impulsivity
 - d. Resignation
5. The pilot's thinking in sentence 8 is characteristic of which aspect of the ADM process?
 - a. Headwork
 - b. Attitude Management
 - c. Stress Management
 - d. Risk Management
6. What class of stressor is evidently affecting the pilot's decision making in sentence 16?
 - a. Physical
 - b. Physiological
 - c. Psychological
 - d. Psychosomatic

4.1 Failed Autorotation -- Night -- Approach -- VMC

The following accident scenario teaches us that there is no such thing as a routine helicopter flight, especially at four o'clock in the morning. Even though the pilot demonstrates his good judgment by carefully circling the landing site prior to making an approach, he is unprepared for a momentary power loss and his lack of autorotation skills cost him his life.

Accident Scenario:

(1) It had been a slow month and a long dull shift when the call came in at 3:30 a.m. CST to pick up a patient at Ham County Hospital for transfer back to our home base. (2) The chief pilot, Bill, was on duty but had to be awakened from a sound sleep. (3) Bill quickly responded and insisted on checking the weather before launching. (4) The report he received from the nearest FSS was clear, visibility 15 miles, temperature 15 degrees F, dewpoint 11 degrees F, winds 180 degrees at 12 knots, altimeter 29.85. (5) Bill also checked with the attending ER personnel and requested the parking lot be cleared and flashing ambulance lights to act as a beacon. (6) We lifted off at 3:45 a.m.

(7) Enroute Bill complained that of six flights this month, four had been to Ham County. (8) He said, "I wish they would at least fence off a helipad, provide lighting and a windsock." (9) I know I can do it. (10) The approach from the south is a piece of cake, but I worry about the two new crews.

(11) As we approached Ham County, Bill radioed his location and announced he would circle the hospital once to inspect the landing site. (12) What he saw did not make him happy. (13) There were still three cars in the northwest corner of the parking lot and what looked like 5-8 foot piles of snow on the sides. (14) His best approach was from the south but this would be into the path of three bright parking lot flood lights. (15) I asked Bill if he knew he'd be landing downwind. (16) All I got was a scowl as he snapped, "I've landed here four times this month already in winds this bad or worse. (17) Who says you always have to land into the wind, anyway? (18) They've probably never had to land in confined areas like this!"

(19) While circling the landing zone Bill seemed to calm down. (20) He remarked that "...things have always worked out before and there wasn't much we could do now but proceed as planned.". (21) As we rolled level and began our approach, the sound of the engine noise abruptly changed. (22) We lost power and Bill suddenly was busy as hell.

(23) The helicopter pitched up violently as Bill bottomed the collective and muttered something about "What's rotor rpm." (24) Then we pitched down to about 45 degrees and Bill said we're going to have to ride it out, there's not much I can do until final flare. (25) Get ready to crash.

Questions:

1. What decision making concept is aptly demonstrated by the pilot in sentences 3 and 5?
 - a. Cockpit resource management
 - b. Skills and procedures
 - c. Risk management
 - d. Stress management
2. What is the antidote for the hazardous attitude presented in sentence 9?
 - a. Not so fast. Think first.
 - b. It can happen to you.
 - c. Obey the rules.
 - d. Taking chances is foolish.
3. What risk element is Bill evaluating in sentence 13?
 - a. Pilot
 - b. Aircraft
 - c. Environment
 - d. Operation
4. The nature of Bill's response in sentence 16 indicates lack of?
 - a. Cockpit resource management
 - b. Headwork
 - c. Risk management
 - d. Stress management
5. What hazardous attitude surfaces in sentences 17 and 18?
 - a. Anti-authority
 - b. Impulsivity
 - c. Invulnerability
 - d. Resignation
6. What hazardous attitude is illustrated in sentence 20?
 - a. Anti-authority
 - b. Impulsivity
 - c. Macho
 - d. Resignation
7. What decision making concept could have had the most influence on preventing the crash?
 - a. Skills and procedures (training)
 - b. Headwork
 - c. Attitude
 - d. Stress management

4.2 Day -- En route -- Mechanical Failure

The following scenario is based on an actual accident. A more-or-less routine cross-country EMS mission ended in disaster because things started to go wrong even before takeoff.

Accident Scenario:

Hospital Orderly's Statement: (1) I like to hang around the Flight Ops office when my duties permit. (2) That day I was up there where I could see the heliport and the pilot doing his preflight. (3) He was out in the beautiful weather with the paramedic walking around the helicopter. (4) I could see they were chatting and laughing as the pilot did his inspection. (5) I suppose they were talking about the upcoming mission over the mountains to Remotesville General Hospital. (6) I got called away, though, so I didn't actually see them take off.

Airport Lineman's Statement: (7) On Wednesday about noon, I happened to be driving by Major Hospital's heliport. (8) I heard a noise and looked out my car window just as the helicopter was taking off. (9) I work at Local Airport and have serviced this helicopter before, so I was familiar with it. (10) I noticed as it flew over that the cowling on the left side was open. (11) I lost track of the helicopter as I drove on and it headed toward the mountains.

Airport Operations Manager's Statement: (12) At approximately 12:30 pm Local Airport Ground Control received a radio call from an airplane holding short of the north runway stating that "something had fallen from the sky and almost struck them." (13) Upon investigation, we found a piece of cowling with the words "Major Hospital EMS" painted on it. (14) The hinges were intact with torn metal from the cowling attached and the latches were in the closed and locked position. (15) The insulating material on the inside was scorched.

Tower Controller's Statement: (16) We cleared the EMS Helicopter from Major Hospital to transit the Airport Traffic Area at 1500 feet AGL en route to Remotesville. (17) The weather was clear and visibility was virtually unlimited. (18) About ten minutes later we sighted black smoke rising from that direction in the vicinity of Blank Mountain.

Accident Investigator's Statement: (19) The crash site was in a boulder strewn bowl shaped depression on Blank Mountain at the 4200 foot level. (20) The helicopter impacted nose high on a heading that would have taken it back in the general direction of Local Airport. (21) There was evidence that both engines had been running, but with the right one at full power and the left one at flight idle, at the time of the crash. (22) Preliminary autopsy reports indicate that the flight nurse and paramedic were not wearing safety restraints as they were both thrown from the fuselage at first impact. (23) The pilot was pinned in the wreckage and burned to death in the intense post crash fire.

Questions:

1. What situational risk element is not referred to in sentence 3?
 - a. Pilot
 - b. Aircraft
 - c. Environment
 - d. Operation
2. What classic piloting psychological pitfall is suggested by the orderly's observation in sentence 4?
 - a. Get-there-itis
 - b. Getting behind the aircraft
 - c. Neglect of flight planning, preflight, etc
 - d. Giving in to peer pressure
3. Which sentence suggests that the pilot failed to recognize a change in the situation?
 - a. Sentence 8
 - b. Sentence 9
 - c. Sentence 10
 - d. Sentence 11
4. The change in the situation, as indicated in sentences 12 and 13, is the result of the influence of which risk element?
 - a. Pilot
 - b. Aircraft
 - c. Environment
 - d. Operation
5. The judgement concept of risk management would have been well illustrated by the pilot in this situation by which action?
 - a. Refusing to fly the mission.
 - b. Filing an FAA flight plan.
 - c. Taking an IFR refresher course.
 - d. Performing a thorough preflight inspection.
7. Once the pilot realized that he didn't have enough power to climb over the mountains and had to start a tight turn back downhill, what type of stress was he most likely experiencing?
 - a. Physical
 - b. Physiological
 - c. Psychological
 - d. All of the above

APPENDIX A

ANSWER KEY

APPENDIX A ANSWER KEY

Psychological Pitfalls Page 6

Answers: 1-e, 2-h, 3-f, 4-j, 5-l, 6-c, 7-d, 8-a, 9-k, 10-i, 11-b, 12-g.

Section 2.1

Answers: 1-c, 2-c, 3-c, 4-d, 5-d, 6-d, 7-a.

Section 2.2

Answers: 1-b, 2-c, 3-d, 4-d, 5-a, 6-c, 7-d, 8-b.

Section 2.3

Answers: 1-a, 2-c, 3-d, 4-b, 5-d, 6-c, 7-a, 8-b.

Section 2.4

Answers: 1-a, 2-d, 3-d, 4-c, 5-a, 6-b, 7-c.

Section 2.5

Answers: 1-c, 2-b, 3-d, 4-b, 5-d, 6-a, 7-b, 8-c, 9-d, 10-b, 11-b.

Section 2.6

Answers: 1-d, 2-a, 3-b, 4-d, 5-a, 6-c, 7-c, 8-b

Section 2.7

Answers: 1-c, 2-a, 3-d, 4-b, 5-d, 6-c, 7-b

Section 2.8

Answers: 1-d, 2-d, 3-a, 4-b, 5-c, 6-d, 7-a, 8-b.

Section 3.1

Answers: 1-c, 2-b, 3-d, 4-d, 5-d, 6-c, 7-a

Section 3.2

Answers. 1-c, 2-a, 3-d, 4-c, 5-d, 6-c, 7-b, 8-a

Section 3.3

Answers: 1-c, 2-c, 3-a, 4-d, 5-b, 6-b, 7-b

Section 3.4

Answers: 1-a, 2-b, 3-a, 4-d, 5-d, 6-b

Section 4.1

Answers: 1-c, 3-d, 3-c, 4-d, 5-a, 6-d, 7-a

Section 4.2

Answers: 1-d, 2-c, 3-c, 4-b, 5-d, 6-d